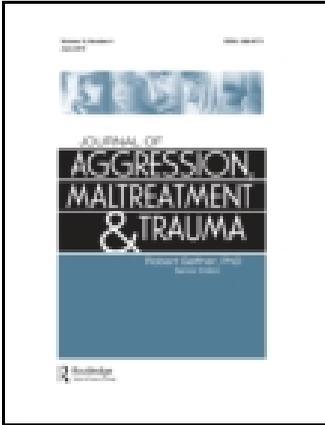


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## Journal of Aggression, Maltreatment & Trauma

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/wamt20>

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Published online: 20 Nov 2013.

To cite this article: Rosemary E. Bernstein, Jeffery R. Measelle, Heidemarie K. Laurent, Erica D. Musser & Jennifer C. Ablow (2013) Sticks and Stones May Break My Bones but Words Relate to Adult Physiology? Child Abuse Experience and Women's Sympathetic Nervous System Response while Self-Reporting Trauma, *Journal of Aggression, Maltreatment & Trauma*, 22:10, 1117-1136, DOI: [10.1080/10926771.2013.850138](https://doi.org/10.1080/10926771.2013.850138)

To link to this article: <http://dx.doi.org/10.1080/10926771.2013.850138>

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## **Sticks and Stones May Break My Bones but Words Relate to Adult Physiology? Child Abuse Experience and Women's Sympathetic Nervous System Response while Self-Reporting Trauma**

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*Child abuse predicts a wide range of long-lasting deleterious outcomes, including disruptions in the biological systems central to emotion arousal and regulation. However, little is known about the specific ways in which child abuse affects adulthood sympathetic reactivity and recovery. This study investigated the association between child abuse experience and adult skin conductance level and habituation in 85 at-risk women as they completed a self-report trauma questionnaire. Childhood emotional abuse was independently associated with blunted skin conductance habituation over the course of survey completion after controlling for other abuse subtypes and current trauma symptoms. These results suggest that women emotionally abused as children experience prolonged emotional arousal and poor physiological regulation of emotion in response to reminders of traumatic experiences.*

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Received 17 July 2012; revised 7 October 2012; accepted 16 October 2012.

This research was supported by the National Institute of Mental Health (Grant 1 R03MH068692-01A1) and the University of Oregon Center for the Study of Women in Society Faculty Research Grant. We would also like to express our gratitude to the research assistants who worked on this project, as well as to the mothers and children who participated in this study.

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*KEYWORDS* adult survivor, emotional abuse, maltreatment, methodology

An expansive and growing body of research links child abuse history to a wide range of deleterious adult psychological and social dysfunctions, including post-traumatic stress disorder (PTSD; e.g., Briere & Elliott, 2003), chronic interpersonal difficulties (e.g., Cook et al., 2005), and an increased likelihood of future child abuse perpetration (e.g., Cort, Toth, Cerulli, & Rogosch, 2011). Multiple theoretical orientations, including the constructivist self development theory (e.g., Pearlman, 1997), trauma theory (e.g., Briere & Elliott, 2003; van der Kolk, 2003), and developmental traumatology (e.g., De Bellis, 2001) converge in their conceptualization of emotion dysregulation (which is widespread in abused populations; Briere & Rickards, 2007) as one mechanism through which these long-term developmental outcomes emerge. Because developing neurobiological systems involved in emotion regulation are most plastic during childhood, it is perhaps unsurprising that childhood maltreatment (i.e., experiences of abuse and neglect) appears to be particularly impactful in the development of these biological systems (e.g., Carpenter et al., 2007).

Work with nonhuman primates (e.g., Coplan et al., 1998), human children (e.g., Cicchetti & Rogosch, 2001), and human adults exposed to early-life stress (e.g., Newport, Heim, Bonsall, Miller, & Nemeroff, 2004) has demonstrated that early adversity is capable of altering psychobiological processes related to stress response and emotion regulation in long-lasting ways. Moreover, cross-fostering studies in research with both animals (Francis, Diorio, Liu, & Meaney, 1999) and humans (Gunnar, Larson, Hertzgaard, Harris, & Brodersen, 1992) have shown that these effects are not merely a function of genomic similarity, thereby further highlighting the importance of early caregiving quality for the development of neurobiological stress response systems.

Although the mammalian stress response consists of two primary systems (i.e., the hypothalamic–pituitary–adrenal axis [HPA], which regulates slower acting responses to stress, and the sympathetic nervous system [SNS], which underlies acute stress responses; Gunnar & Cheatham, 2003), the vast majority of these studies have focused on changes to the HPA axis, including hypersecretion of cortisol, corticotropin-releasing factor, and adrenocorticotropic hormone. Evidence from human adults, for example, has demonstrated dysregulated cortisol response in those with moderate to severe child abuse histories (e.g., Carpenter et al., 2007; Newport et al., 2004; Tarullo & Gunnar, 2006) and more subtle types of insensitive parenting (see Yates, 2007, for review). By comparison, the relative dearth of studies investigating SNS correlates of childhood maltreatment is surprising given that these psychophysiological measures have the advantage of being able to capture

nearly instantaneous reactions to stimuli (cortisol, on the other hand, is not released until several minutes or hours after a stressful event; Hart, 2008).

One of the few studies to measure autonomic reactivity to stressful stimuli in adult victims of child abuse reported no significant differences in heart rate (HR) between child abuse victims and controls (Carpenter, Shattuck, Tyrka, Geraciotti, & Price, 2011). It is important to note, however, that although HR is influenced by both branches of the autonomic nervous system, it is the SNS that is responsible for the rapid mobilization of somatic resources during times of acute stress (Larsen, Berntson, Poehlmann, Ito, & Cacioppo, 2008). Thus, true differences in SNS activity might become more apparent when examining a direct measure of SNS, such as skin conductance level (SCL). Because many of the negative outcomes associated with child maltreatment are themselves linked to SNS dysregulation, it could be that these long-term psychosocial outcomes are at least partly due to early alterations in children's SNS responsivity to socioenvironmental stressors.

#### SYMPATHETIC NERVOUS SYSTEM DYSREGULATION AND PSYCHOPATHOLOGY

Because SNS dysregulation is implicated in a wide range of interpersonal and psychological difficulties, including child abuse perpetration (e.g., McCanne & Hagstrom, 1996), aggression and conduct problems (e.g., Lorber, 2004), mood disorders (e.g., Boettger, Greiner, Rachow, Brühl, & Bär, 2010), anxiety disorders (e.g., Roth et al., 2008), and PTSD (for review see Pole, 2007), the time is ripe to begin to disentangle the independent and joint contributions of SNS functioning from that of childhood abuse to the development of psychopathology. Importantly, those studies that have already begun to address this important aim have demonstrated that trauma and maltreatment-related autonomic dysregulation exists independently from psychopathology. In one such study, Pole and colleagues (2007) assessed the SNS reactivity of 90 nonsymptomatic, psychiatrically healthy police cadets and found that compared to those who did not endorse childhood maltreatment, maltreated cadets showed greater skin conductance response (SCR; i.e., the phasic increase in skin conductance shortly following a stimulus onset) across low-, medium-, and high-level stressors. Additionally, longitudinal studies have shown that SNS dysregulation tends to precede rather than follow or co-occur with the onset of post-traumatic stress symptoms (e.g., Gutner et al., 2010; Pole et al., 2009). Thus, from a developmental perspective, dysregulated arousal to threat could be viewed as a biomarker of vulnerability to psychosocial difficulties.

Of the many psychological disorders linked to SNS dysregulation, PTSD is arguably the most well researched. A meta-analysis of this sizeable literature (Pole, 2007) confirmed reliable associations between PTSD and increased

HR, exaggerated SCR, and a slower SCL habituation (i.e., a slower diminishment of the individual's physiological response to repeated or sustained threat and return to prethreat SCL). SCL habituation is particularly interesting here, as it represents how quickly or efficiently one can adapt to a prolonged or repeated exposure to an aversive stimulus (Pole et al., 2007). Thus, slowed or blunted habituation signifies a failure to recover physiologically or to adapt to new conditions. Importantly, the aforementioned meta-analysis revealed that habituation effect sizes are unrelated to PTSD symptom severity (Pole, 2007), providing further evidence that this SNS marker can exist independently from current psychopathology and be more associated with the experience of early trauma or adversity.

### SUBTYPE SPECIFICITY IN THE SEQUELAE OF CHILD ABUSE

Childhood abuse has been divided into three distinct subtypes: sexual abuse (SA), physical abuse (PA), and emotional abuse (EA). Due to high cooccurrences among these subtypes, some researchers approach childhood abuse as a single, global risk factor (e.g., Edwards, Holden, Felitti, & Anda, 2003). However, others maintain that unpacking the relative impact of each subtype will enable more nuanced understanding of their long-term consequences (e.g., Luthar, 2006). Indeed, several studies have found that SA, PA, and EA relate differently to various developmental sequelae, supporting the notion that child abuse subtypes are qualitatively distinct experiences and are not necessarily additive in their effects on psychosocial functioning. Particularly robust associations exist, for example, between SA and post-traumatic stress (Kaplow, Dodge, Amaya-Jackson, & Saxe, 2005); PA and intimate partner violence (White & Widom, 2003); and EA, depression, social phobia, and low self-esteem (Gibb, Chelminski, & Zimmerman, 2007; Gross & Keller, 1992). Likewise, evidence from HPA research suggests divergent long-term physiological profiles associated with different child abuse subtypes (e.g., Carpenter et al., 2007; Carpenter et al., 2011; Flory et al., 2009), showing that PA and SA uniquely predict HPA dysregulation. Such differences have yet to be explored with respect to SNS functioning.

### THIS STUDY

The primary aim of this study was to examine the association between self-reported childhood abuse experience and current SNS dysregulation in a sample of adult women selected for various risk factors (e.g., poverty, history of depressive symptomology). Moreover, the study sought to decipher the relative links between psychopathological symptomology, child abuse experience, and SCL activity in response to a trauma probe. Based

on research already reviewed distinguishing blunted SCL habituation from trauma symptom severity, it was hypothesized that current post-traumatic symptomology would not be associated with women's SCL habituation to a trauma-related stressor, but that childhood abuse experience would be, even after controlling for these current symptoms. Because research has shown that SNS dysregulation is evident in a number of psychological disorders, we hypothesized that although current symptoms might not relate to participants' SCL habituation slope, they might be associated with increased initial (i.e., intercept-level) SCL activity.

Methodologically, the association between trauma or maltreatment and SNS function has typically been measured in response to three classes of stimuli: (a) a startling sound paradigm (e.g., Pole et al., 2007); (b) a standardized trauma cue method (e.g., Kimble, Fleming, Bandy, Kim, & Zambetti, 2010); or (c) by using an idiosyncratic trauma cue design (i.e., having participants mentally relive their trauma as they read or listen to a detailed narrative of his or her unique traumatic experience written in the present tense; Nixon, Bryant, Moulds, Felmingham, & Mastrodomenico, 2005). A self-report trauma questionnaire, the Brief Betrayal Trauma Survey (BBTS; Goldberg & Freyd, 2006), was used as the trauma stimulus in this study to maintain personal relevance.

The second aim of this study was to assess differential links between various subtypes of abuse and SCL activity. In light of previous trauma research involving primarily HPA dysregulation, it was hypothesized that SA would be associated most strongly with a pattern of maintained (i.e., nonhabituated) SCL arousal, followed by PA. To our knowledge, no previous study has investigated the relative predictive strengths of childhood abuse experiences and current symptoms on adult SNS activity during a trauma stimulus.

## METHOD

### Participants

Participants ( $N = 105$ ) were recruited as part of a prospective, longitudinal effort to identify psychological and psychobiological markers of risk for insensitive parenting in a high-risk population. Pregnant women were recruited from local childbirth education classes, hospitals, and public assistance organizations. They were screened for (a) depressive symptoms using a 9-item version of the Center for Epidemiological Studies–Depression Scale (Radloff, 1977), and (b) their risk for problematic parenting as indicated on the Screening Scale for Problems in Parenting (Avison, Turner, & Noh, 1986), an assessment of women's perceived level of social support and parenting attitudes about nurturance, rejection, control, and autonomy. Women were eligible to participate if they were fluent in English and carrying a single fetus they intended to carry to term. Those with high-risk pregnancies, severe

psychopathology, plans to give the baby up for adoption or relocate within the year, or those using medications that might alter physiological reactivity were excluded from the study.

Participants ranged in age from 18 to 38 years ( $M = 24$ ,  $SD = 4.8$ ). The women were demographically representative of the county (Lane, OR) in which they resided (80.2% European American). The majority (56.6%) earned annual household incomes below \$20,000, and most were either married (41%) or unmarried but living with a partner (42%).

## Measures

### TRAUMA STIMULUS

The BBTS (Goldberg & Freyd, 2006) is a brief questionnaire used to assess the experience of 12 specific traumas experienced before and after 18 years of age. The instrument begins with a multiple-choice section, wherein participants report whether they have experienced each of 12 traumas with the response choices of *never*, *one or two times*, or *more than that*. After this section, respondents answer additional questions about the gender of and their relationship to the perpetrator(s) of each endorsed interpersonal trauma. Traumas on the BBTS include those that are low in betrayal (e.g., a natural disaster), those that entail a medium-level of betrayal (e.g., being severely attacked by someone with whom the respondent was not close), and those that are high in betrayal (e.g., having forced sexual contact with someone with whom the participant was very close), with items from each betrayal level intermixed throughout the measure. Questions avoid using labels (e.g., “sexually abused”), and instead describe them (e.g., “made to have sexual contact”). Although its primary use in the study was as a trauma stimulus, each participant’s level of low, medium, and high betrayal traumatization in adulthood and childhood was calculated for descriptive purposes.

### CHILD ABUSE EXPERIENCE

The Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) is the most widely used retrospective self-report measure of childhood maltreatment. Each subscale contains five items rated on a 5-point Likert scale ranging from 1 (*never true*) to 5 (*very often true*). The CTQ assesses childhood experiences of SA (e.g., “Someone tried to make me do sexual things or watch sexual things”), PA (e.g., “I was punished with a belt, board, cord, or some other hard object”), and EA (e.g., “People in my family said hurtful or insulting things to me”). The CTQ has been successfully used with diverse samples (Baker & Maiorino, 2010), and subscales show high convergent and discriminant validity when compared to clinician-rated interviews (Allen, Huntoon, & Evans, 1999). High test–retest reliability over

2 to 6 months (intraclass correlation = 0.88) indicates robustness against reporting biases due to changes in mood or psychopathological symptoms (Bernstein & Fink, 1998). In this sample, internal consistency reliability using Cronbach's alpha was .91 for EA, .87 for PA, and .95 for SA.

#### CURRENT TRAUMA SYMPTOMS

The Trauma Symptom Checklist-40 (TSC-40; Briere & Runtz, 1989) is a 40-item scale used to assess current levels of six classes of trauma-related symptoms: dissociation, anxiety, depression, sexual abuse trauma index, sleep disturbance, and sexual dysfunction according to a 4-point Likert scale ranging from 0 (*never*) to 3 (*often*). The TSC-40 is a reliable measure with reported full-scale alphas between .89 and .91.

#### SYMPATHETIC NERVOUS SYSTEM ACTIVITY

Physiological data were recorded and time stamped using a 21-channel Bioamplifier (model JCA-09) and sampled continuously with low-pass filtering at 1,000 Hz, and high-pass filtering at 0.03 Hz (James Long Company, Caroga Lake, NY). James Long's PHY software was used to analyze and prorate second-by-second changes in SCL (expressed in microSiemens), as measured through the galvanic skin response using two Ag-AgCl skin conductance electrodes filled with an isotonic NaCl electrolyte gel. Small Velcro bands secured electrodes to the distal phalange of the first two fingers of each subject's nondominant hand, which were then wrapped to secure the wire to the palm. Participants' arms rested palm up at heart level. A constant sinusoidal (AC) voltage (0.5 V rms) was used to avoid biasing the electrodes. Galvanic skin response was assessed throughout the session at a rate of 1,000 readings per second, and SCL was calculated using the James Long Company software. Artifacts (including those due to motion) were edited manually for each channel by identifying outliers (i.e., points more than 3 *SD* above or below the mean) and "windsorizing" them by changing the raw outlier value to be one unit higher than the next most extreme value (i.e., the highest value within 3 *SD* of the mean) in the distribution (see Tabachnick & Fidell, 2007).

#### Procedures

One week prior to their scheduled assessment, participants were mailed a consent form and questionnaire booklet containing items to assess demographic information, current psychopathological symptoms, and history of childhood maltreatment. Women came alone to their 2- to 3-hour-long assessments at a campus laboratory, during which continuous measures of

movement, HR, SCL, respiration, and temperature were recorded. After a series of breathing and talking baselines, participants completed a battery of interviews and behavioral tasks culminating with the BBTS. At the end of the assessment, women completed after-session questionnaires (including a measure of verbal acuity) and were compensated \$40.00 for their time. The study protocol was approved by the host university's Committee for the Protection of Human Subjects.

### Planned Analyses

In their review of the association between child maltreatment and adult psychological difficulties, Briere and Jordan (2009) advised that researchers move away from mere correlations between single types of maltreatment and single types of outcomes, which can result in inaccurate conclusions about the unique contributions of abuse subtypes on adult adjustment (Finkelhor, Ormrod, & Turner, 2007). Accordingly, we modeled the different abuse subtypes together in a single analysis.

As physiological data were recorded on a second-by-second basis, data for each woman varied as a function of the time it took her to complete the task ( $M = 381.66$  seconds,  $SD = 190.17$ ). Thus, the earlier a participant finished the questionnaire, the more "missing" data she had. Hierarchical linear modeling (HLM; Bryk & Raudenbush, 1992), a multilevel analytic tool that can accommodate "missing" data easily and allows for the simultaneous estimation of effects at different levels of aggregation, was used to estimate individual growth or time course trajectories. Specifically, HLM was used to simultaneously model parameters of women's SCL reactivity and habituation (including the intercept, or initial SCL at the beginning of the task, and the slope, or how the SCLs changed over time) as a function of their childhood abuse experiences or current psychopathological symptomology. Therefore, sexual, physical, and emotional forms of child abuse and current trauma symptoms were analyzed simultaneously. A nonlinear, quadratic term was also tested.

## RESULTS

### Missing Data and Preliminary Analyses

Of the 105 women who participated, 20 were excluded from analyses due to a variety of factors, including electrode loss, movement artifacts, or other data collection errors. *T* tests revealed that these 20 women did not differ in their self-reported level of trauma on the CTQ or BBTS. Eight of the remaining 85 subjects were missing 20% or fewer items on one or more of the CTQ subscales, and five subjects were missing two or fewer items on the BBTS. These missing scores were imputed and replaced by the arithmetic

mean of nonmissing responses within the same subscale or category. Second, because the six symptom subscales of the TSC were highly intercorrelated (Fisher's  $r$ -to- $Z$ -to- $r$  average = .74), these symptoms were collapsed into a single aggregate variable (TSC total) to reflect overall psychological distress and to reduce the possibility of multicollinearity.

Third, as the trauma stimulus was a written questionnaire (i.e., the BBTS), it was necessary to examine between-subject variation in reading comprehension to rule out these effects in the primary analyses of interest. Thus, the vocabulary section of the Shipley Institute of Living Scale (SILS-V; Shipley, 1940) was administered. This measure is an expedient self-administered measure of adult verbal intelligence. Tested associations revealed that Shipley's-V scores were unrelated to any subtype of self-reported trauma history on the BBTS or CTQ, current trauma symptoms, or the time subjects took to complete the task; as a result, verbal fluency was not included as a potential covariate in our primary analyses. Likewise, the length of time women took to complete the BBTS was also unrelated to both reports of child abuse victimization and current trauma symptoms, so it was also omitted from further analyses.

### Descriptive Statistics

Descriptive statistics are presented in Table 1. Endorsements of all subtypes of childhood abuse were relatively high in our at-risk sample. Specifically, planned  $t$  tests revealed that compared to women in a large-scale community sample (Scher, Stein, Asmundson, McCreary, & Forde, 2001), women in our sample endorsed significantly higher levels of EA ( $t = 7.98, p < .01$ ) and PA ( $t = 3.98, p < .01$ ), and trended toward increased SA ( $t = 1.68, p = .09, ns$ ).

**TABLE 1** Descriptive Statistics

	<i>N</i>	<i>M</i>	<i>SD</i>
BBTS			
High child	104	1.31	1.61
High adult	102	0.91	1.36
Medium child	104	2.64	9.85
Medium adult	102	1.83	9.82
Low child	103	0.69	0.97
Low adult	101	0.47	0.77
Time to completion (in seconds)	85	372.58	185.16
CTQ			
Emotional abuse	105	10.36	5.12
Physical abuse	105	7.75	4.15
Sexual abuse	105	6.20	3.15
TSC Total	107	24.21	16.17
SILS-V	99	27.90	4.51

*Note.* BBTS = Brief Betrayal Trauma Survey (Goldberg & Freyd, 2006); CTQ = Childhood Trauma Questionnaire (Bernstein & Fink, 1998); TSC = Trauma Symptom Questionnaire (Briere & Runtz, 1989); SILS-V = Shipley Institute of Living Scale-Verbal (Shipley, 1940).

Consistent with prior research, all three abuse subtypes were strongly correlated with each other. SA was moderately correlated with PA ( $r = .49$ ,  $p < .001$ ) and EA ( $r = .49$ ,  $p < .001$ ), and PA was highly correlated with EA ( $r = .70$ ,  $p < .001$ ). The three abuse subscale scores were also significantly associated with self-reported rates of high betrayal trauma in childhood (Fisher's  $r$ -to- $Z$ -to- $r$  average = .58) and adulthood (Fisher's  $r$ -to- $Z$ -to- $r$  average = .30), although they were not generally associated with medium- or low-level betrayal trauma in childhood or adulthood (with the exception of SA, which was modestly related to low betrayal trauma in childhood [ $r = .26$ ,  $p < .001$ ] and adulthood [ $r = .24$ ,  $p < .05$ ]). Also consistent with existing research, childhood abuse experiences were moderately to highly related to current post-traumatic symptoms as measured by the TSC total score ( $r = .45$ ,  $p < .001$  for EA;  $r = .40$ ,  $p < .001$  for PA;  $r = .28$ ,  $p < .001$  for SA).

### Hierarchical Linear Modeling

Both linear and quadratic terms were used to estimate women's SCL trajectories in the HLM baseline model (i.e., without any Level 2 predictors). In this model, the quadratic term was nonsignificant and negligible in size; thus, it was dropped from the model. Next, a two-level HLM was tested with SCL as the outcome variable. At Level 1, within-person variability in SCL was modeled with the intercept and linear slope. The former was centered at the start point of the BBTS, so that the intercept captured women's SCL level at the beginning of the task, and the slope captured second-by-second change in SCL across the task. At Level 2, between-person variability at Level 1 was predicted using individual participant abuse subtype and trauma symptom predictors (i.e., sexual, physical, and emotional abuses, and current trauma symptoms, each grand mean-centered).

Thus the HLM equations were as follows:

#### Level 1 Equation

$$\text{SCL} = P0 + P1^*(\text{Time}) + \text{error}$$

#### Level 2 Equation

$$P0 = B00 + B01^*(\text{Emotional Abuse}) + B02^*(\text{Physical Abuse}) + B03^*$$

$$(\text{Sexual Abuse}) + B04^*(\text{Composite Current Trauma Symptom Score}) + \text{error}$$

$$P1 = B10 + B11^*(\text{Emotional Abuse}) + B12^*(\text{Physical Abuse}) + B03^*$$

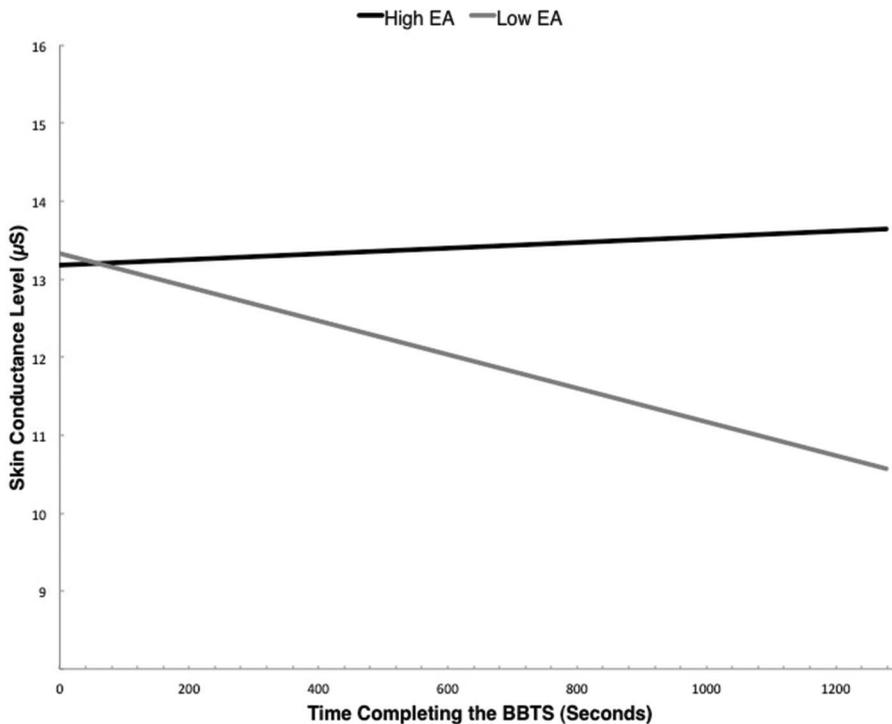
$$(\text{Sexual Abuse}) + B04^*(\text{Composite Current Trauma Symptom Score}) + \text{error}$$

Reliability estimates were high for both the intercept ( $P0$ ) = 0.999 and time (i.e., slope) estimates ( $P1$ ) = 0.982. No Level 2 variables were associated

with SCL intercept. However, EA emerged as a significant predictor of women's SCL slope, ( $b = .0003$ ,  $p < .05$ ). An examination of simple effects revealed that increased EA was associated with more persistently elevated SNS activation while completing the BBTS. To illustrate the difference in SCL trajectories, predicted SCL slopes were plotted for women with EA scores in the upper and lower quartile range for the sample (see Figure 1). Whereas women with EA scores in the lowest 25th percentile showed a normative SCL habituation (i.e., a negative slope), those with scores in the highest quartile maintained elevated SCL through the entirety of the task. None of the other abuse or trauma symptom predictors were significantly associated with measures of SCL.

## DISCUSSION

According to the results of this study, high levels of self-reported childhood EA appear to be uniquely associated with disrupted SNS activity in response



**FIGURE 1** Skin conductance level during trauma questionnaire completion as a function of emotional abuse history. *Note.* Skin conductance level (SCL) habituation during women's completion of the Brief Betrayal Trauma Survey (BBTS) for the highest and lowest quartiles of childhood emotional abuse (EA) scores.

to the recall of traumatic events. Specifically, experience with childhood EA was associated with persistently high SCLs (i.e., a failure to habituate arousal) during women's completion of a trauma questionnaire. EA was not, however, associated with participants' SCL at the start of the task, nor were SA, PA, or current post-traumatic symptoms. Together, these results suggest that EA experiences are uniquely associated with a dysregulated failure to habituate to an emotionally stimulating task, as indexed by an increase in SNS activity during the recall of personal trauma history.

Addressing the first aim, as hypothesized, the blunted SCL habituation observed in PTSD samples generalized to a very different sample across demographic characteristics (i.e., gender and age), adverse experiences (i.e., child abuse vs. military combat), and presenting symptoms (i.e., diagnosed PTSD vs. subclinical depressive symptoms). This finding was somewhat unsurprising, as meta-analyses have shown that military traumatization yields smaller, not larger, aggregate habituation effect sizes compared with other traumas, and that the effect sizes are not significantly related to post-traumatic symptom severity (Pole, 2007). Nevertheless, because this effect has never been demonstrated in a sample of economically and psychosocially at-risk women, the findings reported here might help bridge the literature on female survivors of child abuse with that on the physiological correlates of PTSD (a literature that has overwhelmingly relied on samples of middle-aged, male victims of military trauma; Pole, 2007).

Addressing the second aim, subtype-specificity was observed in the association between childhood EA and blunted SCL habituation to a trauma cue, although not in the anticipated direction. It was hypothesized that SA and PA would be associated most strongly with blunted SCL habituation during BBTS completion, but we found instead that EA emerged as the sole predictor of women's failure to show SCL habituations during the task. That the distal factor of childhood EA was associated with SCL habituation, even while considering current symptomology (a more proximal index of experience) simultaneously, suggests that this SNS biomarker is sensitive to EA experience independent of current symptoms.

### Why Emotional Abuse?

Although EA has historically received less empirical attention than other abuse subtypes, some argue that because it is the form that most directly targets the self-worth of a child (Hart & Brassard, 1987), it is the core factor underlying the broadly deleterious effects of child maltreatment (Hart, Binggeli, & Brassard, 1998; Navarre, 1987). Several studies that have simultaneously considered multiple forms of child abuse have shown that the negative effects of EA are equivalent to or greater than other forms of abuse (e.g., Gibb et al., 2007; Spertus, Yehuda, Wong, Halligan, & Seremetis, 2003). Lasting alterations in stress psychophysiology might help to explain these

effects. Indeed, in a recent review of the lasting psychobiological effects of emotional abuse, Yates (2007) argued that there is a “strong evidentiary base for the assertion that childhood EA is likely to undermine the development and operation of human stress response systems with enduring negative implications for adaptation” (p. 18).

In an attempt to understand what it is about EA that explains this unique association, it is helpful to frame the findings through the two-factor learning theory model (e.g., Lang, Davis, & Öhman, 2000), which posits that different stressful experiences trigger divergent functionally appropriate responses. Given diverse factors such as chronicity, frequency, predictability, and closeness to the perpetrator, it follows that different types of early adversity might lead to different psychobiological response patterns. With regard to children’s emerging stress response systems, extant research suggests that recurrent patterns of hostile, unpredictable, and degrading emotional exchanges in the caregiving environment, features that might characterize childhood EA, have enduring negative effects (Yates, 2007). Furthermore, it has been argued that the degree to which a trauma represents a betrayal by a trusted person on whom the victim depends will influence the way in which that event is processed, with traumas higher in betrayal linked to more severe outcomes (e.g., Freyd & DePrince, 2001). According to these criteria, we might argue that indeed, compared to other forms of child abuse, EA tends to be more chronic (i.e., it is less likely than SA or PA to occur within isolated, discrete episodes—limited to more specific parameters and contingencies) and is more typically perpetrated by a primary caregiver, and thus, implies higher levels of betrayal. In fact, the CTQ questions regarding EA explicitly identify the perpetrator as a parent or other family member, whereas items measuring PA and SA do not.

As a child’s stress biology develops within his or her early social environment, we interpret our findings to suggest that the chronic belittling, contempt, and betrayal inherent in EA might disrupt developing affective regulatory capacities as indexed by SNS habituation to a trauma stimulus. Because habituation reflects the process by and rate at which an organism regulates its response to prolonged exposure to aversive stimuli, it would appear that completing the BBTS was more persistently arousing or threatening for those with a greater history of EA. In addition to direct effects of EA on stress response systems, it might also be that EA indirectly affects stress responsivity and recovery via psychological processes (e.g., reductions in self-esteem; Gross & Keller, 1992). Indeed, there is some evidence that cognitive mechanisms such as perceived control and predictability can regulate the activity of stress response systems (e.g., Sapolsky, 1994). In this study, childhood EA was uniquely associated with blunted SCL habituation, which has significant implications for the way we think about the sequelae of different forms of child abuse.

An alternative interpretation of these findings might be that they are due to the high incidence of childhood EA, relative to PA or SA in this sample. This imbalance might reflect selection bias introduced by exclusion of individuals with more severe mental health histories. It could be that effects of other forms of child abuse were undetectable due to participants' comparatively low endorsements of physical abuse and sexual abuse. However, this pattern is not unique to this sample. In fact, retrospective reports frequently indicate that relative to other forms of abuse, childhood EA is more prevalent (e.g., Gross & Keller, 1992).

### Limitations

Despite demonstrations of subtype-dependent impacts of childhood abuse, teasing apart the unique contributions of each involves noteworthy methodological challenges. First, abuse is seldom limited to childhood, but instead tends to reoccur throughout development, with abused children at a greater risk of revictimization in adolescence and adulthood (e.g., Classen, Paless, & Aggarwal, 2005). The analyses reported here did not consider such intermediary experiences; however, we acknowledge the possibility that found effects could also relate to later events or the accumulation of events across time. Similarly, we did not assess other possible contributing factors, such as the influence of parental factors including mental illness and parental care, or attachment style.

Second, our index of child abuse was limited to retrospective self-reports. Although it is appropriate to exercise caution in interpreting such data, we know that inaccuracies are mostly in the direction of under-, not overreporting (Hardt & Rutter, 2004). Future studies could benefit by incorporating information from multiple informants (e.g., legal records, sibling reports) and methods (e.g., interviews), which might also provide important supplemental information about potential moderators of abuse outcomes, including age of onset (Kaplow & Widom, 2007), intra- versus extrafamilial perpetration (Lorentzen, Nilsen, & Traeen, 2008), frequency and duration (English, Graham, Litrownik, Everson, & Bangdiwala, 2005), bodily penetration in the context of SA (Fergusson, Boden, & Horwood, 2008), and injury severity in PA (Elder, 2005). Third, because we did not compare one's SCL while completing the BBTS to her SCL during other lab stressors, we cannot speak to whether blunted SCL habituation is a general response style to heterogeneous stressors, or only to those related to trauma. Future studies might compare participant SNS activity during trauma-related stressors with that during other types of stressors (e.g., a noninterpersonal stressor such as a difficult mental arithmetic task, or an interpersonal stressor related to intimate partner conflict or parent-child conflict). Notwithstanding these limitations, this investigation is notable for several reasons. First, the study is unique in that the nature of the biological data collected is rich. Specifically,

women's second-by-second SCLs were used to detect idiosyncratic differences in their autonomic trajectories while confronting a trauma cue. This person-centered model enables a more nuanced description of women's continuous psychobiology compared to more global physiological recordings. This second-by-second analysis of SCL during participants' engagement with a protracted trauma cue allows for the observation of psychobiological activation in real time. Additionally, by modeling various forms of child abuse together, we were protected against making faulty conclusions about their individual contributions to developmental outcomes (Finkelhor et al., 2007).

### Implications

This study has several important clinical and empirical implications worth highlighting. First, the nature of the sample used might provide external validity for understanding paths from real-world abuse situations to psychopathological symptoms and diagnoses. Although research on trauma and child abuse often recruits participants from psychiatric populations who have experienced extreme forms of abuse, more moderate maltreatment is far more pervasive, affecting an estimated 5.8 million children each year (U.S. Department of Health & Human Services, Administration on Children Youth & Families, 2009), with females and those from low socioeconomic status backgrounds at an especially high risk (Kessler et al., 1995). Because we know that as adults these maltreated individuals are more likely to utilize mental health services (van der Kolk, 2003), our findings might be more confidently generalized to typical clinical patient populations.

Second, whereas the bulk of stress regulation research has examined responsivity to either a nonpersonalized stress task or to a lengthy personal narrative, a novel contribution of this study was its use of a brief but highly personalized stressor (i.e., women's recall of their abuse experiences while completing a structured trauma questionnaire). This method requires no audiovisual media equipment. It does not need multiple appointments to prepare, record, and then read each participant trauma narrative, and it contains items selected for their widespread salience and written to be inclusive of a range of traumatic experiences. Thus, it might be a more transportable, efficient, inexpensive, and relevant alternative to more time- and labor-intensive experimental paradigms. Taken together, these characteristics make the method highly accessible to other empiricists, as well as clinicians, who might use this method as a tool for the early identification of stress dysregulation to facilitate targeted early intervention in cases of childhood EA.

Lastly, in addition to this potential methodological contribution to clinical practice, current findings have several implications for treatment more generally. For one, it could be that the prolonged SNS arousal we saw during

women's completion of a trauma survey generalizes to the therapy room when clients are asked about their histories of trauma. As such, clinicians might wish to take more time in building rapport with emotionally abused clients and take care to support them during these conversations. It could also be that a treatment objective for these clients should focus on improving their stress and emotion regulation skills via, perhaps, meditation training or exposure and desensitization. Our findings could also be used for psychoeducational purposes; that is, by letting clients know that childhood EA can really "get under the skin" (and into their physiology) in lasting ways, and should be taken just as seriously as PA and SA. Finally, in the context of family therapy, knowing the long-term costs of EA might also make clinicians more vigilant about instances in which caregivers (perhaps with EA histories of their own) emotionally abuse their children, and strengthen the case for intervention to change these patterns.

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